Hedging versus not hedging: strategies for managing foreign exchange transaction exposure

Scott McCarthy
Senior Lecturer in Finance
Queensland University of Technology
Brisbane, Queensland, Australia
Contact: Tel.: +61 7 3864 5390;
Fax: +61 7 3864 1500;
Email: s.mccarthy@qut.edu.au

Abstract
This paper compares a number of strategies for managing foreign exchange exposures. The strategies are never hedging, hedging every exposure using a forward exchange contract, and hedging on selective occasions using a forward exchange contract. With regard to the selective hedging, the decision as to whether to hedge or not depends on the future spot exchange rate as determined by a number of forecasting techniques. The techniques include the random walk, the large premia model and a volatility model. The paper considers the USD vis a vis the AUD, SGD and JPY. The results are mixed and show that for the period 1992 to 2003 the Australian exporter is better off always hedging while the Singapore and Japanese exporters are better off never hedging. The various management strategies are compared using Sharpe's model and the minimum variance model though it seems the results are not sensitive to use of either.

JEL classification: F31

Keywords: Selective foreign exchange currency hedging; random walk; large premia model; volatility model.

1. Introduction

Foreign Exchange (FX) transaction exposure exists when firms have financial obligations due to be settled in foreign currencies. For example, a firm may be due to be paid foreign currency (FC) in 3 months for some goods it exported. When the FC is received, they will need to be converted into the firm's home currency (HC). If during the 3 month period the value of the HC has appreciated against the FC, the firm will receive less HC for each unit of FC. Depending on the magnitude of the HC appreciation, this can be costly for the firm. In this case, the firm can protect itself against this outcome by managing the exposure utilizing any of a large choice of alternatives.

The most complete solution is for the firm to ensure that the exposure is not created in the first instance. For the firm this could be achieved by billing the buyer in HC. The problem of transaction exposure is then passed on to the buyer. For various reasons including, lack of market power or potential lose of competitiveness, this may not be a viable option. Assuming then that the exposure is created, in the most general terms the firm can choose between internal hedges and external hedges. Internal hedges include leading and lagging of payments and foreign currency accounts while external hedges include derivatives such as forwards, futures, options and swaps. Forward FX contracts (FEC) are the simplest of the external hedges and the most used. The popularity may be partly explained by their simplicity of use, over the counter trading that permits exact specifications regarding dates and amounts and minimal explicit cost.

The purpose of this paper is to test the hedging effectiveness of FECs. Consistent with existing literature, the FECs performance will be compared to that of an unhedged position or fully exposed position. One of the immediate difficulties faced in making a statement regarding the effectiveness of various hedging strategies is that a definition of effectiveness is not heterogeneous among hedgers. For one hedger, a good hedge may be one that reduces risk to some degree with nil or minimal impact on return. Another hedger may be prepared to accept a 'significant' reduction in expected return in exchange for complete certainty. As a result, any research such as the current paper that has as its purpose the identification of the better decision, must clearly define at the outset what is best. Two approaches are used here. First, from the traditional finance utility maximization framework the risk/return tradeoff is considered. Drawing on the thread of literature with regard to equity portfolios and diversification and hedging, the Sharpe-ratio model of Howard and D'Antonio (1984, 1987) is used. Secondly, taking a narrower view of hedging, assuming that it is only concerned with risk reduction, the minimum-variance model of Ederington (1979) is used.

The second purpose of this paper is to expand on the exposure management analysis above, by introducing selective hedging strategies that are implemented as a result of forecasts of the future spot rate. In the case above the hedger was passive. That is, the decision was between the two polar extremes of hedging every exposure with a FEC or remaining unhedged; there was no middle ground. In contrast, a selective hedger makes a judgement on each exposure. For example, if it is believed that the exchange rate will move in a favourable direction, the exposure would remain unhedged. If on the other hand the exchange rate is expected to move in an unfavourable direction, the exposure should be hedged. In this paper, the random walk and volatility models amongst others will be used to forecast the future spot rate. The forecasts will determine whether a particular exposure should be hedged with an FEC or remain unhedged.

The contributions of this research are, first, it extends the work of Morey and Simpson (2001) by considering the USD vis a vis a number of significant Pacific Rim/Asian currencies. Second, the current research expands the set of forecasting models used to make the decision to hedge or not, introducing the volatility model which is also combined with the random walk forward premia rule. In addition to examining a different data set to Morey and Simpson, the performance measures of Jong et al. (1997) are used. Morey and Simpson consider FEC but measure their performance with ex post efficient frontiers and a simple return per unit of risk measure. Jong et al. compare futures to remaining unhedged but use the Sharpe-ratio and minimum-variance as measures.

The rest of the paper is designed as follows. Section 2 discusses the relevant literature. Section 3 discusses the various hedging strategies and the data used. Section 4 discusses the results. Section 5 concludes the paper.

2. Literature review

A number of streams of literature can be identified in the area of FX exposure management/hedging. Most fundamental is the debate as to whether firms should hedge. This debate has been well covered in the literature and finance texts, such as Smith, Smithson and Wilford (1990). The accepted wisdom is that the firm can add value by hedging due to market imperfections and economies of scale. Another stream of literature uses surveys to investigate whether firms hedge and why, characteristics of firms that hedge, and what methods/instruments are used to hedge. A particular stream of relevance to this paper concerns passive and selective hedging. The finance literature is rich with papers that preach the benefits to investors of international equity and debt investment. Eun and Resnick (1994) extended this work by considering the impact on the investment results when exchange rate risk is hedged with FECs. While the results were mixed for various asset classes, the study did show improvement of the risk-return outcome when the international investments were hedged. Glen and Jorion (1993) concurred, though when they extended the analysis to include the use of Black's (1990) universal hedge ratio found hedging added little improvement. Eun and Resnick (1997) next introduced the distinction between passive and selective hedging. They discuss the literature concerning the forward rate being an unbiased predictor of the future spot and the subsequent literature identifying the risk premium in the forward rate that makes them in fact biased estimators. Eun and Resnick identify Messe and Rogoff's (1983) work on the efficiency of the random walk that showed it superior to or at least the equal to any forecasting technique as offering a selective hedge indicator. The implication being that the current spot is the best indicator of the future spot. For an exporter receiving a foreign currency, the random walk would suggest only hedging by locking in the forward rate when it is higher (that is, a more favourable rate for the exporter) than the expected spot. Eaker and Grant (1990) used this strategy and found it produced superior results to always hedging. Up to the work by Eun and Resnick (1997) the evidence was mixed in that most studies found some improvement though the results ranged from large improvements to minimal (and in some cases none) for various portfolios. For example, Glen and Jorion (1993) found that selective strategies offered no improvement over a fully hedged strategy for a portfolio of the world bond or world stock index.

The contribution of Eun and Resnick (1997) was to firstly uses the traditional passive hedge of FECs but also introduce a passive strategy using put options. They also considered a number of variants of the random walk as the basis for the selective strategies. Their results, using the Sharpe measure of portfolio performances, show that the selective strategies based on the random walk offer superior outcomes for an internationally diversified stock portfolio than either of the passive strategies or remaining unhedged. Jong et al (1997) studied the hedging performance of FX futures. They noted however that "[naïve] hedging with currency futures transforms currency risk into basis risk", and hence their focus was to test for the optimal hedge ratio.

Morey and Simpson (2001) have recently extended this work by considering different data and expanding the set of selective hedging strategies. They consider hedging only when the forward premium is historically large and when a relative purchasing power parity model indicates an

incorrectly priced bilateral exchange rate. Using ex post efficiency frontiers and return per unit of risk to compare the strategies they find that for a 12 month time period the 'large premia' strategy (by the terminology used so far in the current paper this is a selective strategy) gives the best result, superior to the selective strategy based upon the random walk. In addition, they note that in all cases the unhedged strategy performs better than the always hedge strategy.

3. Hedging strategies evaluated and data

The first two strategy used in the study are passive. The first is to not hedge. As discussed above, this means that the firm's exposed amount is subject to the movements of the relevant exchange rate. The second passive strategy is to always hedge the exposure. In this paper when a decision is made to hedge it will be done with a FEC. That is, a value will be locked in today at which the foreign currency receipt can be exchanged into the home currency at a nominated later date.

Of the selective strategies studied, the first is based upon the random walk. This theory suggests that today's spot rate is the best forecast of the future spot rate. If the forward rate is a better rate than current spot rate, an FEC will be used. If however the current spot is more favourable than the forward rate the position will be left unhedged. A variant of this model is the large premia as used by Morey and Simpson (2001) and McCarthy (2002). This hedging strategy uses an FEC when the forward margin is positive and historical large. The logic of this is that there will be times when the firm hedged but in hindsight would have been better off exposed. That is, initially the forward rate is at a premium but ends up lower than the spot rate. This will occur less frequently if the premium needs to be larger and result in fewer hedges than under the random walk strategy. An average premia will be calculated from an out of sample set of exchange rate data and the current forward premium (discount) will be compared to this.

An adjustment is also made to this average premia by multiplying it by 1.5. This increases the required margin before a hedge would be placed and so further reduces the disadvantage of hedging when the spot rate subsequently moves in a favourable direction after a FEC has been used. The average forward margin is also adjusted by 0.5, which increases the number of hedges compared to the random walk but requires less than for the large premia.

Next, a variant of the volatility model of McCarthy (2002) is used that recommends hedging when the spot rate displays excessive volatility. Excessive volatility is deemed to exist when the moving average of the exchange rates short term volatility is greater than the moving average of the exchange rates long term volatility. The short term volatility is measured by the moving average of the previous 6 months exchange rate versus 12 months for the long term. Equation 1 shows the model and the application for the short run calculation.

$$\sum_{t=1}^{T}\left(\frac{E_t - E_{t-1}}{E_t}\right)^2$$

$$\text{or}\left(\frac{E_t - E_{t-1}}{E_t}\right)^2 + \left(\frac{E_t - E_{t-2}}{E_t}\right)^2 + \left(\frac{E_t - E_{t-3}}{E_t}\right)^2 + \left(\frac{E_t - E_{t-4}}{E_t}\right)^2 \qquad (1)$$

Where:
Et = the exchange rate at time t.
Et-1 = the exchange rate at time t-1.

The final selective strategies evaluated combine the 3 large premia rules and volatility. If on any date either suggests hedging, a FEC will be used. These methods therefore favour a conservative approach as either of the rules can trigger implementing a hedge. Only if both suggest not hedging will the exposure remain unhedged.

The study applies the above rules to monthly FX data from 1992 to 2003. Specifically, the bilateral rates considered are the USD vis a vis the AUD, the Japanese yen (JPY) and the Singapore dollar (SGD). For the JPY and the SGD the total period consided is from February 1993 until January 2003. To calculate the volatility model, the FX data for each of the previous 12 months was also required. Due to some data restrictions, the AUD analysis covered the period November 1993 to January 2003. Again, the 12 months prior to November 1993 were used for the volatility model. Given the large period considered, and the fact that it included the Asian financial crisis which clearly impacted on each of these economies and hence exchange rates to various degrees, two sub-periods were also created. The first sub-period examined up to the end of June 1997. The second sub-period considered from July 1997, generally regarded as the start of the crisis beginning in Thailand, until January 2003.

The exchange rates used are sourced from Bloomberg and represent end of day mid rates. As per market convention the AUD / USD rate is in American terms where the AUD is the unit. The SGD and JPY / USD quotes are in European terms, thus the USD is the unit. This distinction becomes important when interpreting the results. If it is assumed that in each scenario the analysis considers a home country firm exporting and receiving USD, the Australian exporter would be better off as the unit (AUD) depreciated, while the Japanese and Singaporean exporters would prefer to see the unit (USD) appreciate.

As mentioned in the introduction, comparisons are made between each of the hedging strategies and the unhedged option. This allows conclusions to be drawn as to whether hedging is better than remaining unhedged and also as to which hedge, if any, is superior. Because on any occasion there is an equal likelihood that the actual future spot rate will turn out to be more or less than the locked in forward rate, intuitively it would be expected that the selective alternatives should show to be the better choice, than either of the passive polar extremes of not hedging and always using a FEC. Whether or not this occurs will depend on the accuracy of their “forecast”.

Two measurements of “better” are employed. First, the minimum variance model of Ederington (1979) is used. This model, equation 2, compares the variance of the unhedged returns to the variances of the various hedged returns. The basis of the measure is that less volatility, as measured by the variance, is preferred to more volatility. From equation 3 it follows that a positive outcome indicates that the hedge has a lower variance and under this decision rule would be preferred. A negative outcome indicates that the hedge increases the volatility of the returns and therefore the firm would have been better off remaining unhedged.

$$HE_{mv} = 1 - \frac{\sigma^2_{r_p}}{\sigma^2_{r_s}} \quad (2)$$

where

HEmv = hedging effectiveness of the minimum-variance measure

$\sigma^2_{r_p}$ = the variance of the returns of the hedged position

$\sigma^2_{r_s}$ = the variance of the returns of the unhedged position

Secondly, the Sharpe-ratio model of Howard and D'Antonio (1984, 1987) is used. In its standard form the Sharpe ratio provides a risk adjusted performance measure as shown in equation 3.

$$S = \frac{R_i - R_f}{\sigma_i} \quad (3)$$

Where

S = the Sharpe measure

Ri = the return for portfolio i during the time period

Rf = the risk-free rate during the time period

σ_i = the standard deviation of the rate of return for portfolio i during the time period

It can be used as in equation 4 to measure the improvement in performance that hedging offers, (if any), over remaining unhedged.

$$HEs = \frac{r_f + \left[\left(r_h - r_f\right)/\sigma_h \;\right]\sigma_s - r_s\rfloor}{\sigma_s} \quad (4)$$

Where

r_f = the risk-free rate of return

r_h = the rate of return for the hedged position

r_s = the rate of return for the spot (unhedged) position

σ_h = the standard deviation of the hedged position

σ_s = the standard deviation of the spot (unhedged) position

The performance of the unhedged alternative is judged by the mean and variance of the monthly returns of the spot rate. Being unhedged, the firm will exchange the foreign currency (FC) receipts at the then current spot rate. Effectively the cost of this strategy is the difference between

the home currency (HC) equivalent at the time the contract was entered (t0) and when the foreign currency is received (t1). If the FC has appreciated vis a vis the HC, each unit of FC will buy more HC and hence will represent a negative cost, that is, a benefit. Conversely, if the FC has depreciated vis a vis the HC, each unit of FC will buy less HC and hence represent a cost.

When hedged with a FEC, the real cost of the hedge is an opportunity cost. This is because when the contract is entered, the firm receiving the FC would immediately enter the FEC and hence forgo the opportunity to benefit from a favourable spot rate movement. That is, if the FC appreciates, the firm would have been better off without the hedge. Thus, the true cost of the FEC per HC worth of FC sold forward is represented by equation 5 and from these the mean and variance of each alternative is calculated for input into equation 4.

$$f1 - e1/e0 \qquad (5)$$

Where
f1 = the forward rate locked in at time 0.
e1 = the spot rate at time 1.
e0 = the spot rate at time 0.

4. Results

The results are presented in two sections: the Sharpe ratio effectiveness and the minimum variance model effectiveness.

Sharpe ratio effectiveness
Table 1 shows the Sharpe ratio effectiveness and table 2 the minimum variance model effectiveness. Within these are separate sub-tables for each of the 3 bilateral rates. As mentioned above, due to the conventional method of exchange rate quoting, a negative answer for the AUD/USD rate indicates a superior outcome compared to the unhedged position, while for the other two quotes, a negative number indicates an inferior outcome compared to the unhedged position. As discussed in the paper, the unhedged value and the always hedge with an FEC hedge will represent the extreme values; the remaining hedges are combination of these two and hence their values will always fall between these. A value of 0 indicates the hedge offers the same outcome as remaining unhedged.

INSERT TABLE 1 HERE

For the AUD, the results for the Sharpe ratio show that for the full period using both a 3 and 12 month FEC, the always hedge alternative offers superior outcomes than does the unhedged position. This is also the case for period 1, while for period 2 both outcomes are inferior.

With regard to the other selective alternatives, for the 3 month FEC, only the 3 combinations return a poorer outcome for the full period. In period 1 all hedge alternatives are superior to remaining unhedged. Period 2 shows mixed results. For the 12 month FEC for the full period all (bar one) hedges produce superior results to remaining unhedged. This pattern is the same for period 1. Period 2 again produces less impressive outcomes for hedging.

In summary, the results across the 3 month and 12 month are consistent. The majority of outcomes (70%) show full hedging or selective hedging with FECs is superior to remaining unhedged. An interesting result is the strong performance of the random walk model. For both the full period and for period 1 the random walk produces the largest (negative) outcome; inferring the 'best' hedge. Recall from the above discussion that the random walk theory suggests that today's spot rate is the best forecast of the future spot rate. The implication for this study being, that if the forward rate is a better rate than the current spot rate, an FEC will be used. If however the current spot is more favourable than the forward rate the position will be left unhedged.

For the SGD, period 1 has the most positive results (a superior result to remaining unhedged) for both the 3 and 12 month FECs. For the 3 month FEC within period 1 all but the volatility and combination 2 are superior to remaining unhedged with the strongest performer being always hedging then the random walk. For the full period and period 2 there is little improvement from hedging. It is difficult with any consistency to conclude that for the SGD any hedging alternative is superior to remaining unhedged, however when the 12 month FEC is considered the random walk does offer some superior outcomes.

For the JPY, there were no occasions where the always hedge offered a superior performance. For the 3 month FEC however there were a number of positive outcomes and some consistency with the SGD in period 1.

To summarise the Sharpe measure, for both the AUD (always hedge) and the SGD (random walk) the results do show some degree of consistency regarding the superior outcome from hedging.

Minimum variance model effectiveness

Table 2 shows that as with the Sharpe ratio, the minimum variance model for the AUD shows a strong outcome in favour of hedging, whether it is always with an FEC or selectively. For both the 3 and 12 months FECs for all periods, the always hedge produced a superior result to remaining unhedged. In total, 72% of hedges were superior to remaining unhedged.

INSERT TABLE 2 HERE

For both the SGD and JPY the results show that on no occasions did the always hedge produce a superior outcome to remaining unhedged. Indeed, there was little evidence to show that the any hedge was consistently superior to remaining unhedged. While there were some superior outcomes resulting from hedging, it is not possible to draw any strong conclusion other than remaining unhedged was the superior performer (or no worse) in 80% of the cases for the SGD and in 85% of the cases for the JPY.

5. Conclusion

The general conclusion that can be drawn from the results is that over the period considered, always hedging is preferable to remaining unhedged for an exporter with an AUD exposure while remaining unhedged is superior to always hedging for both the SGD and JPY. The finding concerning the AUD is supportive of those who argue that firms with an exposure should always hedge as their comparative advantage is not in predicting exchange rate movements. With regard to the selective hedging alternatives, the random walk model performed well, especially so for AUD exposures. The conclusions drawn from the findings for the SGD and the JPY are not what would generally be recommended to a firm. On a short term or one off basis this would be extremely dangerous as an adverse exchange rate movement may cause substantial financial damage, but the results suggest that for firms that have exposures repeatedly over a long period of time that hedging offers no benefit.

It seems that the method of comparing the outcomes, either Sharpe or minimum variance, does not significantly impact on the findings.

In terms of further research, it would be of interest to extend the study to consider other currencies though it does become difficult in this region with fixed or at least pegged exchange rates. A case study or some survey work may also be of interest to discover what firm's are actually doing, if anything, about this issue. The issue will continue to be an important one, as many of these countries do experience volatile exchange rate movements. At the time of writing the AUD is reaching a six year high vis a vis the USD.

References

Black, F. 1990. Equilibrium Exchange Rate Hedging, Journal of Finance, 45:899-907

Eaker, M. and. Grant, D. 1990 Currency Hedging Strategies for Internationally Diversified Equity Portfolios. The Journal of Portfolio Management, Fall: 30-32.

Ederington, L. 1979. The Hedging Performance of the New Futures Markets, The Journal of Finance, 34(1): 157-170.

Eun, C. and Resnick, B. 1994 International Diversification of investment Portfolios: US and Japanese Perspectives, Management Sciences, 40: 140-161.

Glen, J. and Jorion, P. 1993. Currency Hedging for International Portfolios, Journal of Finance, 48: 1865-1886.

Howard, C. and D'Antonio, L. 1984. A Risk-Return Measure of Hedging Effectiveness, Journal of Financial and Quantitative Analysis, 22(3): 377-381.

Howard, C. and D'Antonio, L. 1987. A Risk-Return Measure of Hedging Effectiveness: A Reply, Journal of Financial and Quantitative Analysis, 19(1): 101-112.

Jong, A., De Roon, F. and Veld, C. 1997 Out-of-sample Hedging Effectiveness of Currency Futures for Alternative Models and Hedging Strategies. The Journal of Futures Markets, 17(7): 817-837.

McCarthy, S. 2002. A Simulation Analysis of the Performance of Foreign Exchange Exposure Management Strategies International Journal of Business Studies, Vol 10, no. 2: 27-44

Messe, R. and Rogoff, K. 1983. Empirical Exchange Rate Models of the Seventies: do they fit out of sample? Journal of International Economics, 14: 3-24.

Morey, M. and Simpson, M. 2001 To Hedge or not to Hedge: the performance of simple strategies for hedging foreign exchange risk. Journal of Multinational Financial Management, 11: 213-223.

Smith, C. Smithson, C. and Wilford, D. 1989. Managing financial Risk, Journal of Applied Corporate Finance, 1(4): 27-48.

Table 1
Minimum Variance model
(All by 100)

AUD 3 months:

	1	2	3	4	5	6	7	8	9
Full	-6.699	2.354	0.103	-0.006	-6.699	0.033	0.276	0.276	0.288
Period 1	-3.793	1.268	-6.470	-6.514	-3.793	-5.183	-1.555	-1.525	-1.555
Period 2	-6.423	-1.337	3.575	3.755	-6.423	0.001	-0.172	-0.172	-0.172

AUD 12 months:

	1	2	3	4	5	6	7	8	9
Full	-40.812	-12.695	-15.688	-16.658	-12.413	-2.421	-1.067	1.706	-1.067
Period 1	-22.147	-7.138	-40.173	-9.229	-29.020	-23.261	-16.582	5.343	-36.465
Period 2	-38.623	-14.791	-9.752	-9.752	-9.669	1.587	1.410	1.410	1.410

SGD 3 months:

	1	2	3	4	5	6	7	8	9
Full	-8.680	-0.699	1.556	2.788	0.334	-4.024	0.0	0.219	0.0
Period 1	-34.099	-13.044	-11.225	-4.477	-6.516	3.021	-0.187	6.104	-0.187
Period 2	-4.878	-1.967	0.117	0.749	0.0	-7.702	0.0	0.0	0.0

SGD 12 months:

	1	2	3	4	5	6	7	8	9
Full	-88.687	-11.728	4.745	7.402	-0.653	-29.995	0.0	0.0	0.0
Period 1	-272.04	-14.996	-10.391	-10.391	-3.550	-30.885	-0.163	-0.163	0.0
Period 2	-66.807	-13.210	-4.219	7.006	-2.581	-34.272	0.0	0.0	0.0

JPY 3 months:

	1	2	3	4	5	6	7	8	9
Full	-6.309	0.315	0.307	0.307	0.307	-2.822	0.0	0.0	0.0
Period 1	-11.626	0.767	0.738	0.738	0.738	-2.546	0.0	0.0	0.0
Period 2	-1.938	0.0	0.0	0.0	0.0	-3.120	0.0	0.0	0.0

JPY 12 months:

	1	2	3	4	5	6	7	8	9
Full	-38.340	0.0	0.0	0.0	0.0	-24.003	0.0	0.0	0.0
Period 1	-60.327	0.0	0.0	0.0	0.0	-24.462	0.0	0.0	0.0
Period 2	-18.297	0.0	0.0	0.0	0.0	-23.907	0.0	0.0	0.0

Table 2
Sharpe Ratio effectiveness
(All by 100)

AUD 3 months:

	1	2	3	4	5	6	7	8	9
Full	-0.475	-20.878	-18.763	-18.338	-0.475	-0.913	3.699	3.817	3.699
Period 1	-42.588	-50.020	-15.061	-13.699	-42.588	-15.971	-2.465	-2.051	-2.465
Period 2	16.229	-9.745	-21.410	-21.410	16.229	5.450	6.425	6.425	6.425

AUD 12 months:

	1	2	3	4	5	6	7	8	9
Full	-14.633	-45.085	-36.925	-23.370	-52.484	-5.699	-0.396	4.035	-0.396
Period 1	-83.111	-97.165	-46.125	-5.329	-67.048	-29.209	-14.287	3.018	-57.588
Period 2	9.617	-26.393	-33.498	-33.498	-33.617	5.003	5.895	5.895	5.895

SGD 3 months:

	1	2	3	4	5	6	7	8	9
Full	-27.053	-0.980	-4.422	-8.245	1.286	-14.649	0.0	-1.122	0.0552
Period 1	31.340	23.639	21.459	11.556	12.508	-12.060	0.329	-7.813	0.329
Period 2	-48.019	-7.708	-11.836	-14.529	-1.346	-17.927	0.0	0.0	0.0

SGD 12 months:

	1	2	3	4	5	6	7	8	9
Full	-60.652	5.450	-3.138	-5.392	-5.616	-20.799	0.049	0.049	0.0
Period 1	-8.710	23.360	17.912	17.912	6.106	-6.737	0.295	0.295	0.0
Period 2	-76.908	0.834	-8.494	-11.421	-9.513	-27.070	0.0	0.0	0.0

JPY 3 months:

	1	2	3	4	5	6	7	8	9
Full	-28.578	5.813	5.745	5.745	5.745	-7.970	0.0	0.0	0.0
Period 1	-16.884	13.601	13.441	13.441	13.441	-6.975	0.0	0.0	0.0
Period 2	-37.467	0.0	0.0	0.0	0.0	-8.665	0.0	0.0	0.0

JPY 12 months:

	1	2	3	4	5	6	7	8	9
Full	-97.350	0.0	0.0	0.0	0.0	-17.176	0.0	0.0	0.0
Period 1	-73.392	0.0	0.0	0.0	0.0	-14.688	0.0	0.0	0.0
Period 2	-119.123	0.0	0.0	0.0	0.0	-18.912	0.0	0.0	0.0

ISSN 1324-5910

All correspondence to:

Associate Professor Andrew C Worthington
Editor, *Discussion Papers in Economic, Finance and International Competitiveness*
School of Economics and Finance
Queensland University of Technology
GPO Box 2434, BRISBANE QLD 4001 Australia

Telephone: 61 7 3864 2658
Facsimile: 61 7 3864 1500
Email: a.worthington@qut.edu.au

Queensland University of Technology

DISCUSSION PAPERS IN ECONOMICS, FINANCE AND INTERNATIONAL COMPETITIVENESS

Hedging versus Not Hedging: Strategies for Managing Foreign Exchange Transaction Exposure

Scott McCarthy

Discussion Paper No. 162 November 2003

Series edited by

Associate Professor Andrew C Worthington

School of Economics and Finance

RECENT DISCUSSION PAPERS

Higgs, H & Worthington A, The prospects for Geographic Diversification in UK Regional Property Investment: Implications Derived from Multivariate Co-integration Analysis, No 111, June 2002

Ryan, S K & Worthington, A, Time-Varying Market, Interest Rate and Exchange Rate Risk in Australian Bank Portfolio Stock Returns: A GARCH-M Approach, No 112, June 2002

Drew, M E, Subramaniam, N & Clowes-Doolan, K, Students' Experience o f the Honours' Supervisory Relationship: A Preliminary Investigation, No 113, June 2002

Worthington, A, Kay-Spratley, A & Higgs, H, Transmission of Prices and Price Volatility in Australian Electricity Spot Markets: A multivariate GARCH Analysis, No 114, July 2002

Hernandez, J & Layton, A, The Regional Appropriateness of Monetary Policy: An Application of Taylor's Rule to Australian States and Territories, No 115, August 2002

Taing, S H & Worthington, A, Co-movements Among European Equity Sectors: Selected Evidence from the Consumer Discretionary, Consumer Staples, Financial, Industrial and Materials Sectors, No 116, September 2002

Goffey, K & Worthington, A, Motor Vehicle Usage Patterns in Australia: A Comparative Analysis of Driver, Vehicle & Purpose Characteristics for household & Freight Travel, No 117, September 2002

Lahiri, R, On Optimal monetary Policy in a Liquidity Effect Model, No 118, October 2002

Valadkhani, A, Identifying Australia's High Employment Generating Industries, No 119, October 2002

Valadkhani, A, Modelling Demand for Broad Money in Australia, No 120, December 2002

Worthington, A & Higgs, H, The Relationship Between Energy Spot and Futures Prices: Evidence from the Australian Electricity Market, No 121, November 2002

Li, S, A Valuation Model for Firms with Stochastic Earnings, No 122, November 2002

Higgs, H & Worthington, A, Tests of the Random Walk Hypothesis for Australian Electricity Spot Prices: An Application Employing Multiple Variance Ratio Tests, No 123, November 2002

Robinson, M, Best Practice in Performance Budgeting, No 124, November 2002

Lee, B, "Output and Productivity Comparisons of the Wholesale and Retail Trade Sector: US and Australia, 1991 to 1999", No 125, November 2002

Drew, M E, & Stanford, J D, Risk Superannuation Management in Australia: Risk, Cost and Alpha, No. 126, January 2003

Drew, M E, & Stanford, J D, A Review of Australia's Compulsory Superannuation Scheme after a Decade, No. 127, January 2003

Drew, M E, & Naughton, T, & Veerarghavan, M, Asset Pricing in China: Evidence from the Shanghai Stock Exchange, No. 128, January 2003

Clements, A, & Drew, M E, Investor Expectations and Systematic Risk, No. 129, January 2003

Drew, M, Superannuation Funds: The Fees and Performance Debate, No. 130, January 2003

Valadkhani, A, History of Macroeconomic Modelling: Lessons from Past Experience, No. 131, January 2003

Valadkhani, A, Long and Short-Run Determinants of Money Demand in New Zealand: Evidence from CoIntegration Analysis, No. 132, January 2003

Anderson, J, Optimal f and Portfolio Return Optimisation in US Futures Markets, No. 133, January 2003

Anderson J, A Test of Weak-Form Market Efficiency in Australia Bank Bill Futures Calendar Spreads, No. 134, January 2003

Aruman, S, The Effectiveness of Foreign Exchange Intervention in Australia: A Factor Model Approach with GARCH Specifications, No 135, January 2003

Lahiri, R, A Further Exploration of Some Computational Issues in Equilibrium Business Cycle Theory, No 136, February 2003

Valadkhani, A, How Many Jobs Were Lost With the Collapse of Ansett? , No. 137, February 2003

Drew, M E, Naughton, T, & Veerarghavan, M, Is Idiosyncratic Volatility Priced? Evidence from the Shanghai Stock Exchange, No. 138, February 2003

Valadkhani, A, Does the Term Structure Predict Australia's Future Output Growth? No. 139, February 2003

Worthington, A, & Higgs, H, A Multivariate GARCH analysis of the Domestic Transmission of Energy Commodity Prices and Volatility: A comparison of the Peak and Off-peak Periods in the Australian Electricity Spot Market, No. 140, February 2003

Li, S, The Estimation of Implied Volatility from the Black-Scholes Model: Some New Formulas and Their Applications, No. 141, February 2003

Drew, M E, & Stanford, J D, Principal and Agent Problems in Superannuation Funds, No. 142, March 2003

Li, S, A Single-Period Model and Some Empirical Evidences for Optimal Asset Allocation with Value-at-Risk Constraints, No. 143, March 2003

Valadkhani, A, An Empirical Analysis of the Black Market Exchange Rate in Iran, No. 144, April 2003
Worthington, A, Business Expectations and Preferences regarding the Introduction of Daylight Saving in Queensland, No. 145, May 2003

Worthington, A, Losing Sleep at the Market: An Empirical Note on the Daylight Saving Anomaly in Australia, No. 146, May 2003

Robinson, M, Tightening the Results/Funding Link in Performance Budgeting Systems, No. 147, May 2003

Worthington, A & Higgs, H, Risk, Return and Portfolio Diversification in Major Painting Marketing: The Application of Conventional Financial Analysis to Unconventional Investments, No. 148, June 2003

Valadkhani A, Demand for M2 in Developing Countries: An Empirical Panel Investigation, No. 149, July 2003

Worthington A, & Higgs H, Modelling the Intraday Return Volatility Process in the Australia Equity Market: An Examination of the Role of Information Arrival in S & PASX Stocks, No 150, July 2003

Lahiri R, Tax Distortions in a Neoclassical Monetary Economy in the Presence of Administration Costs, No 151 September 2003

Layton A, & Smith D, Duration Dependence in the US Business Cycle, No 152, August 2003

Valadkhani A & Layton A, Quantifying the Effect of GST on Inflation in Australia's Capital Cities: An Intervention Analysis, No 153, September 2003

Worthington A, & Valadkhani A, Measuring the Impact of Natural Disasters on Capital Markets: An Empirical Application Using Intervention Analysis, No 154, September 2003

Robinson M**,** The Output Concept and Public Sector Services, No 155, September 2003

Worthington A, Brown K, Crawford M, & Pickernell D, Socio-Economic and Demographic Determinants of Household Gambling in Australia, No 156, September 2003
Worthington A, & Higgs H, Tests of Random Walks and Market Efficiency in Latin American Stock Markets: An Empirical Note, No 157, September 2003

(Replacing Previous No 158) Worthington A, & Higgs H, Systematic Features of High-Frequency Volatility in Australian Electricity Markets: Intraday Patterns, Information Arrival and Calendar Effects, No 158, November 2003

Worthington A, & Higgs H, Weak-form Market Efficiency in European Emerging and Developed Stock Markets*,* No 159, September 2003

West T, & Worthington A, Macroeconomic Risk Factors in Australian Commercial Real Estate, Listed Property Trust and Property Sector Stock Returns: A Comparative Analysis using GARCH-M, No 160, October 2003

Lee, B, Interstate Comparison of Output and Productivity in the Australian Agricultural Sector – 1991 – 1999, No 161, October 2003